

AQA A-Level Chemistry

# Period 3 elements

Questions only

The newest questions, about an hour. All 11 are in the exam generator.

Questions

**10**

Total marks

**44**

Time allowed

**57 min**

Name

Class or teacher

Date

## Instructions

- Answer all questions in the spaces provided.
- Use black ink. Show your working for every calculation.
- You may use a scientific calculator and the AQA Data Sheet.
- Print the separate mark scheme when you are ready to mark your answers.

## For marking

| Q  | Source              | Marks | Score |
|----|---------------------|-------|-------|
| 1  | 2021 A-level P1 Q3  | 12    |       |
| 2  | 2022 A-level P1 Q5  | 15    |       |
| 3  | 2018 A-level P3 Q25 | 1     |       |
| 4  | 2025 A-level P3 Q11 | 1     |       |
| 5  | 2025 A-level P3 Q19 | 1     |       |
| 6  | 2025 A-level P3 Q26 | 1     |       |
| 7  | 2025 A-level P3 Q30 | 1     |       |
| 8  | 2025 A-level P3 Q31 | 1     |       |
| 9  | 2020 A-level P3 Q2  | 5     |       |
| 10 | 2023 A-level P1 Q3  | 6     |       |

Total \_\_\_\_\_ / 44      Percentage \_\_\_\_\_ %

Questions from AQA past papers, 2018–2025, reproduced for revision. Practise these topics online, with instant marking:  
[whiteboardchemistry.com/revision/aqa-a-level-chemistry/exam-questions?topics=period-3-oxides&len=0](https://whiteboardchemistry.com/revision/aqa-a-level-chemistry/exam-questions?topics=period-3-oxides&len=0)

## Questions

Period 3 elements · 10 questions · 44 marks · time allowed 57 min

### Q1 · November 2021 · Paper 1 · Q3 · [12 marks]

This question also needs Group 2.

This question is about elements in Period 3 and their compounds.

**(a)** When a piece of sodium is added to  $200\text{ cm}^3$  of water in a large beaker a vigorous reaction occurs. The temperature of the water increases by  $25\text{ }^{\circ}\text{C}$

Give an equation, including state symbols, for the reaction of sodium with water.

Suggest why it is dangerous to react a similar piece of sodium with  $10\text{ cm}^3$  of water in a boiling tube.

[2 marks]

Equation

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Why it is dangerous

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**(b)** Give an equation for the reaction of phosphorus(V) oxide with water.

Suggest a pH for the solution formed.

[2 marks]

Equation

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pH

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**(c)** Explain, in terms of crystal structure and bonding, why silicon(IV) oxide has a higher melting point than phosphorus(V) oxide.

**[4 marks]**

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**(d)** An element in Period 3 forms an oxide that is insoluble in water.

This oxide reacts with sulfuric acid and with aqueous potassium hydroxide.

Give the formula for this oxide.

Give an equation for the reaction of this oxide with sulfuric acid.

**[2 marks]**

Formula

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Equation

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**(e)** Give the formula of a hydroxide of an element in Period 3 used in medicine.

**[1 mark]**

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(f) Identify the element in Period 3, from sodium to chlorine, that has the largest atomic radius.

[1 mark]

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**Q2 · June 2022 · Paper 1 · Q5 · [15 marks]**

This question also needs Atomic structure and Bonding.

This question is about Period 3 elements and their compounds.

(a) Which is not a correct statement about magnesium hydroxide?

Tick (✓) one box.

|                                                       |                          |
|-------------------------------------------------------|--------------------------|
| It is used to neutralise stomach acid                 | <input type="checkbox"/> |
| It forms a solution with pH = 14 at 25 °C             | <input type="checkbox"/> |
| It has the empirical formula $\text{H}_2\text{MgO}_2$ | <input type="checkbox"/> |

[1 mark]

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(b) Give an equation for the reaction of aluminium oxide with sulfuric acid.

[1 mark]

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**(c)** Identify a reagent or test that could be used to distinguish between aqueous solutions of sulfur dioxide and sulfur trioxide with the same concentrations.

State the observation in each case.

**[3 marks]**

Reagent or test

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Observation with sulfur dioxide solution

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Observation with sulfur trioxide solution

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**(d)** The mass spectrum of the element phosphorus has a peak at  $m/z = 124$

Give the formula of the species responsible for this peak.

**[2 marks]**

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**(e)** Give an equation for the reaction of phosphorus(V) oxide with sodium hydroxide solution.

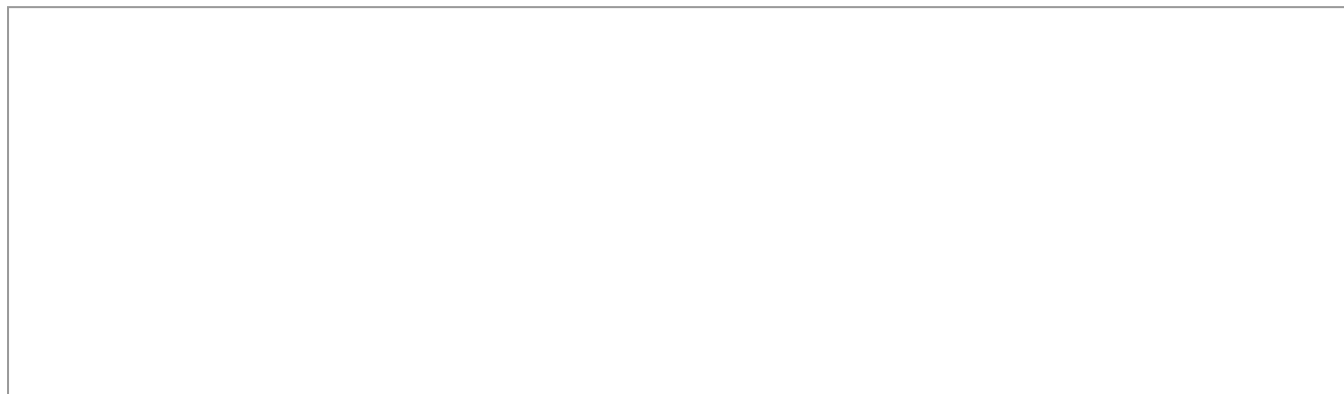
**[1 mark]**

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**(f)** Draw the displayed formula of the molecule formed when phosphorus(V) oxide reacts with water.

**[1 mark]**



(g) The table below shows the melting points of three substances.

| Substance         | Melting point / K |
|-------------------|-------------------|
| sodium chloride   | 1074              |
| chlorine          | 172               |
| hydrogen chloride | 158               |

Explain why the melting points of these substances are different.

You should refer to the structure of and bonding in each substance.

**[6 marks]**

[illegible]

**Q3 · June 2018 · Paper 3 · Q25 · [1 mark]**

Which element forms an ionic oxide that reacts with strong alkalis?

Tick (✓) one box.

- ☐ **A** Aluminium
- ☐ **B** Magnesium
- ☐ **C** Sodium
- ☐ **D** Sulfur

**Q4 • June 2025 • Paper 3 • Q11 • [1 mark]**

The melting points of some Period 3 oxides are shown.

Oxide  $\text{Na}_2\text{O}$   $\text{MgO}$   $\text{Al}_2\text{O}_3$   $\text{SiO}_2$   $\text{P}_4\text{O}_{10}$   $\text{SO}_3$

Melting point / °C 920 2900 2040 1610 580 17

Which row is correct?

Simple

Giant ionic Giant covalent molecular

Tick (✓) one box.

- ☐ **A** Giant ionic:  $\text{Na}_2\text{O}$ ,  $\text{MgO}$ ,  $\text{Al}_2\text{O}_3$  · Giant covalent:  $\text{SiO}_2$  · Simple molecular:  $\text{P}_4\text{O}_{10}$ ,  $\text{SO}_3$
- ☐ **B** Giant ionic:  $\text{Na}_2\text{O}$ ,  $\text{MgO}$ ,  $\text{Al}_2\text{O}_3$  · Giant covalent:  $\text{SiO}_2$ ,  $\text{P}_4\text{O}_{10}$  · Simple molecular:  $\text{SO}_3$
- ☐ **C** Giant ionic:  $\text{Na}_2\text{O}$ ,  $\text{MgO}$  · Giant covalent:  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$  · Simple molecular:  $\text{P}_4\text{O}_{10}$ ,  $\text{SO}_3$
- ☐ **D** Giant ionic:  $\text{Na}_2\text{O}$  · Giant covalent:  $\text{MgO}$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_3$  · Simple molecular:  $\text{P}_4\text{O}_{10}$ ,  $\text{SO}_3$

**Q5 • June 2025 • Paper 3 • Q19 • [1 mark]**

0.100 mol of each of the oxides listed is added to separate 1.00 dm<sup>3</sup> samples of water.

Which oxide produces the solution with the lowest pH?

Tick (✓) one box.

- ☐ **A**  $\text{MgO}$
- ☐ **B**  $\text{Al}_2\text{O}_3$
- ☐ **C**  $\text{SO}_2$
- ☐ **D**  $\text{SO}_3$

**Q6 • June 2025 • Paper 3 • Q26 • [1 mark]**

Which statement is correct?

Tick (✓) one box.

- ☐ **A** A minimum of 0.5 mol of water is needed to react completely with 1 mol of  $\text{Na}_2\text{O}$
- ☐ **B** A solution of hydrochloric acid containing 1 mol of  $\text{HCl}$  reacts with 1 mol of  $\text{MgO}$  to form a solution with pH 7
- ☐ **C** A solution of hydrochloric acid containing 6 mol of  $\text{HCl}$  reacts completely with 1 mol of  $\text{Al}_2\text{O}_3$
- ☐ **D** A minimum of 4 mol of water is needed to react completely with 1 mol of  $\text{P}_4\text{O}_{10}$

**Q7 • June 2025 • Paper 3 • Q30 • [1 mark]**

Equal amounts of three Period 3 elements are added to separate  $100\text{ cm}^3$  samples of water.

Which list is correct when the solutions formed from these elements are arranged in order of decreasing pH?

Tick (✓) one box.

- ☐ **A** chlorine magnesium sodium
- ☐ **B** chlorine sodium magnesium
- ☐ **C** magnesium sodium chlorine
- ☐ **D** sodium magnesium chlorine

**Q8 • June 2025 • Paper 3 • Q31 • [1 mark]**

The oxides  $\text{P}_4\text{O}_{10}$  and  $\text{SO}_2$  both react with water to form acid molecules.

Which row gives the correct shape around the central atom for each acid molecule that is formed?

Molecule formed from  $\text{P}_4\text{O}_{10}$     Molecule formed from  $\text{SO}_2$

Tick (✓) one box.

- ☐ **A** Molecule formed from  $\text{P}_4\text{O}_{10}$ : pyramidal · Molecule formed from  $\text{SO}_2$ : pyramidal
- ☐ **B** Molecule formed from  $\text{P}_4\text{O}_{10}$ : pyramidal · Molecule formed from  $\text{SO}_2$ : tetrahedral
- ☐ **C** Molecule formed from  $\text{P}_4\text{O}_{10}$ : tetrahedral · Molecule formed from  $\text{SO}_2$ : pyramidal
- ☐ **D** Molecule formed from  $\text{P}_4\text{O}_{10}$ : tetrahedral · Molecule formed from  $\text{SO}_2$ : tetrahedral

**Q9 · November 2020 · Paper 3 · Q2 · [5 marks]**

This question also needs Transition metals.

This question is about oxides.

**(a)** Sodium oxide forms a solution with a higher pH than magnesium oxide when equal amounts, in moles, of each oxide are added separately to equal volumes of water.

State why both oxides form alkaline solutions.

Suggest why sodium oxide forms a solution with a higher pH than the solution formed from magnesium oxide.

**[2 marks]**

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**(b)** Give an equation for the reaction between phosphorus(V) oxide and water.

**[1 mark]**

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**(c)** In the Contact process, sulfur(IV) oxide is converted into sulfur(VI) oxide using vanadium(V) oxide as a catalyst.

Give two equations to show how the vanadium(V) oxide acts as a catalyst in this process.

**[2 marks]**

Equation 1

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Equation 2

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**Q10 · June 2023 · Paper 1 · Q3 · [6 marks]**

This question is about Period 3 elements and their oxides.

**(a)** Give an equation for the reaction between phosphorus and an excess of oxygen.

[1 mark]

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**(b)** Give an equation for the reaction between sulfur dioxide and water.

[1 mark]

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**(c)** Give the displayed formula for the anion formed when sulfur trioxide reacts with water.

[1 mark]

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**(d)** Give an equation for the reaction of magnesium with steam.

State one observation made.

[2 marks]

Equation

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Observation

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(e) Give an equation to show how an excess of magnesium oxide reacts with phosphoric acid ( $\text{H}_3\text{PO}_4$ ).

[1 mark]

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Mark scheme:

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